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(54) (Title of Invention) Tuft-Embroidering Machine

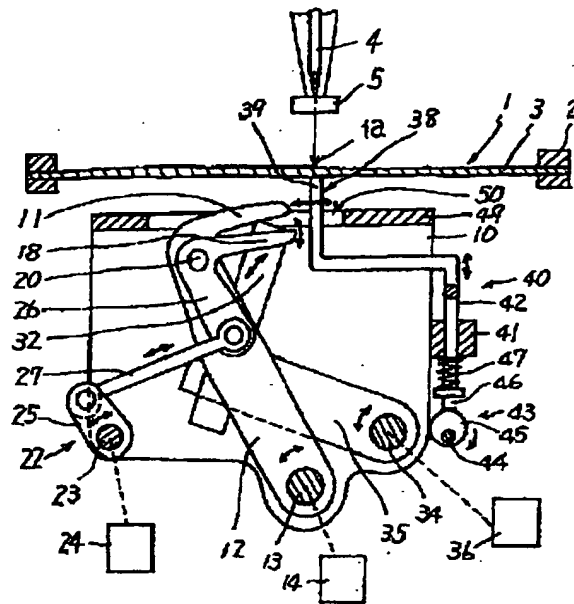
(57) (Abstract)

(Purpose)

To provide a tuft-embroidering machine capable of moving a cloth in an arbitrary direction and of forming a free embroidery pattern.

## (Constitution)

A tuft-embroidering machine is equipped with a vertically moveable needle 4 for vertically carrying a yarn through a cloth 3 put on a needle location 1a, with a laterally moveable looper 11 for scooping the yarn carried on the lower side of the cloth by the downward movement of the needle, with a yarn-cutting means 30 for cutting the yarn scooped with the looper at a place near to the looper, and furthermore with a yarn holding means 16 for holding the yarn scooped with the looper at a place nearer to the needle than a position at which the yarn will be cut with the cutting means.



## (Scope of Claims)

## (Claim 1)

[Translation omitted.]

## (Claim 2)

[Translation omitted.]

## (Detailed Explanation of the Invention)

(0001)

## (Industrial Field of Application)

This invention relates to a tuft-embroidering machine that sews yarn onto a cloth in cut pile condition.

(0002)

(Prior Art)

Conventional machines of this type are equipped with a vertically moveable needle for carrying yarn through a cloth located where needle be lowered, a cloth catch component to catch the lower surface of the cloth and stop the cloth from sagging established at both sides of the area where the needle will be lowered, a laterally moveable looper for picking up the yarn that is carried through to the underside of the cloth when the needle is lowered, and a yarn cutting means to cut the yarn that is picked up by the looper. (For example, refer to Public Patent Disclosure Bulletin [Kokai] No. 3-206165.) In this type of machine, a yarn carried to the underside of a cloth by a needle penetrating the cloth will be picked up by a looper, and then the needle will be raised. By doing this, a loop pile can be formed which is suspended from the looper on the underside of the cloth. When the cloth is moved laterally and this type of operation is repeated, as two loop piles are formed suspended from the looper, the first loop pile formed is cut to make cut pile. In this way, the loop pile connected to the needle cannot be cut, and therefore even if the yarn is pulled by vertical movement of the needle, operation can be continuous, without incidents of yarn being pulled out of the cloth.

(0003)

(Problems that the Invention is to Solve)

Because in this conventional tuft-embroidering machine two loop piles must be suspended from the looper, it has the problem of the direction of cloth movement being limited to directions lateral and parallel to the looper. In addition, the direction of cloth movement is limited in order to slip the two loops suspended from looper out from between the cloth catch components to accompany cloth movement.

(0004) The purpose of the invention of this patent application is to provide a tuft-embroidering machine that solves the aforementioned problems of conventional technology (technical issues), enables movement of cloth in an arbitrary direction, and enables the formation of free embroidery patterns.

(0005)

(Means of Solving the Problems)

To achieve the aforementioned purpose, the tuft-embroidering machine in this applied-for invention is a tuft-embroidering machine equipped with a vertically moveable needle for vertically carrying a yarn through a cloth put on needle drop location, with a laterally moveable looper for scooping the yarn carried on the lower side of the cloth by the downward movement of the needle, with a yarn-cutting means for cutting the yarn scooped with the looper at a place near to the looper, and is equipped with a yarn-holding means for holding the yarn scooped with the looper at a place nearer to the needle than a position at which the yarn will be cut with the cutting means.

(0006)

(Operation)

When a needle lowering motion carries a yarn through the lower side of cloth, that yarn will be scooped up by a looper. Next, if the section of the scooped up yarn that is connected to the needle is held by a yarn-holding means, then even if that yarn is cut by the yarn cutting means, the yarn connected to needle will be prevented from inadvertently coming out of the cloth following later needle movement. When the aforementioned cut yarn moves laterally accompanying lateral movement of the cloth, then whatever the direction of movement, the aforementioned yarn can be passed through between reciprocal, slender bar-shaped cloth support pieces.

(0007)

(Working Example)

The following is an explanation of drawings that illustrate a working example of this patent application. In Figures 1 and 2 which show main parts of one tuft-embroidering machine, 1 indicates the location where cloth to be embroidered is retained, for example, the retention location where cloth 3 to be embroidered is stretched tightly and held in cloth holding frame 2. The cloth 3 is moved in the aforementioned retention location 1 to the front-back and left-right by the horizontal motion of cloth holding frame 2 moved through a commonly known drive device. 4 shows a needle, for example, attached to a commonly known vertically moveable needle bar, and the needle moves freely up and down through designated needle drop location 1a on retention location 1. 5 is a commonly known cloth push that prevents the cloth 3 from lifting up when needle 4 that pierces cloth 3 is pulled out of cloth 3. Cloth push 5 moves up and down synchronously with needle 4. It is also acceptable to have more than one needle 4 and cloth push 5 arranged in a row, similar to an ordinary multi-needle machine, where they can be positioned selectively above needle drop locations.

(0008)

Next, 10 is a base frame to support the various aforementioned structures, for example, a commonly known bed in a sewing machine. 11 is a looper, equipped so that it is laterally moveable along the bottom location of aforementioned needle drop location 1a. For example, the support piece 12, integrated as one piece with the looper 11, is attached to a support shaft body 13 that rotates freely on base frame 10, and through rotation of a drive device linked to shaft body 13, for example a pulse motor 14, the aforementioned lateral movement occurs based on movement in an arc centering on shaft body 13. Lateral movement based on linear sliding motion is also acceptable.

(0009)

Next, 16 which is well illustrated in Figure 3 is a yarn holding means, shown for example comprised of part of aforementioned looper 11 and yarn holding piece 18. 17 is a yarn receiving area formed along the bottom surface of looper 11 that, together with the constriction holding area 19 on yarn holding piece 18, constricts and holds the yarn. Yarn holding piece 18 pivots on support piece 12 via pin 20, for example, so that it [yarn holding piece 18] advances and recedes facing yarn receiving area 17. Furthermore, 21 is a hole to prevent accidental contact with the bottom edge of needle 4. 22 in Figure 1 is a drive mechanism of yarn holding means 16, rotated, for example, by pulse motor 24 as a drive device connected to shaft body 23 that rotates freely on base frame 10. Based on the

rotation, yarn holding piece 18 advances and recedes as stated above via lever 25 attached to shaft body 23, link 27, and lever 26 integrated as one piece with yarn holding piece 18.

(0010)

Next, 30, as particularly well illustrated in Figure 3, shows the yarn cutting means comprised of part of aforementioned looper 11 and moveable knife 32. 31 is a cutting blade on looper 11 established on one edge of the bottom surface of looper 11. The upper edge of knife 32 has a cutting blade 33 that is able to move forward and backward along looper 11 with cutting blade 31 and cutting blade 33 contacting each other. As shown in Figures 1 and 2, a support piece 35 is fixed to support shaft body 34 mounted to base frame 10, for example, and the aforementioned forward and backward movement occurs based on rotation of the pulse motor 36 shown as an example drive device linked to shaft body 34.

(0011)

Next, 38 shown in Figures 1, 2, and 5 is a cloth catch component to catch the lower surface of cloth 3 to prevent cloth 3 from sagging when needle 4 goes through cloth 3. Cloth catch component 38 is comprised of several, for example three, cloth catch pieces 39. It is also acceptable for it to be comprised of even more cloth catch pieces. The upper ends of aforementioned cloth catch pieces 39 are each a very narrow surface area comprised of a slender bar-shaped cloth catch area 39a, and furthermore these cloth catch areas 39a are arranged spaced with a gap between each to allow yarn to slip through. In this example, the cloth catch areas 39a are evenly spaced so that all of them are positioned below ring-shaped cloth push 5. 40 shows a support mechanism to support free vertical movement of the aforementioned cloth catch component 38 and is comprised of a support component 41 attached to base frame 10 and a vertically moveable up/down bar 42 attached to support component 41 and also attached to aforementioned cloth catch piece 39. 43 is an up/down mechanism to vertically move cloth catch component 38 synchronously with vertical movement of needle 4. The up position of cloth catch component 38 based on the aforementioned mechanism 43 is, for example, established at a position where the upper edge of 39 cloth catch piece's cloth catch area 39a touches the bottom surface of cloth 3 in cloth retention area [1]. Conversely, the down position is a position that will not hamper lateral movement of cut yarn to be described later when yarn moves laterally together with cloth 3, for example, a position where the aforementioned cloth catch area 39a is lowered to about midway of cut yarn dangling from cloth. The aforementioned up/down mechanism 43 is shown as a mechanism comprised of cam 45 attached to shaft body 44 that rotates synchronously with vertical movement of cloth push 5, and with a trailing component 46 integrated with support component 41 that trails aforementioned cam 45 based on spring 47. Also, 49 shows a cover component to conceal the various aforementioned structures: it is attached to base frame 10 and at the same time, has an opening 50 to expose components such as looper 11 and knife 32. The machine comprised of the aforementioned structure's various components could also have several heads arranged like a commonly known multi-head machine. In that case, it is acceptable to establish shaft bodies 13, 23, 34, and 44

separately on each head, but if they are established commonly on each head, then the motor to drive each shaft body on each head can be shared and this is desirable.

(0012)

The operation of the items in the aforementioned structure is explained in Figure 6 Time Chart and Figures 7 (A) – (E) which show the conditions of operation at each point in time in the Time Chart. Cloth catch components were omitted from the drawings in Figure 7 to avoid figure line convergence. All mechanisms are as shown in Figure 1 when main shaft angle is at the datum of  $0^\circ$  (in this example the main shaft angle is set at  $0^\circ$  when needle 4 is in top-dead-center position). Based on main shaft movement, needle 4 goes through cloth 3 at needle drop location 1a until it reaches bottom dead center while carrying yarn to the lower side of cloth 3 (main shaft angle  $180^\circ$ ). In this case, cloth catch component 38 is raised to the height of cloth retention location to support the bottom surface of cloth 3. Therefore, cloth 3 does not sag and is held at a designated height position even when needle 4 penetrates cloth 3 and a downward pressing force is applied to cloth 3. After that, as shown in Figure 7 (A), yarn 52 loosens slightly when needle 4 is raised a little (main shaft angle of  $205^\circ$  for example). Next, looper 11 advances to pick up location and picks up yarn 52 as shown in Figure 7 (B). Also, needle 4 comes out of the upper side of cloth 3. In this case, needle 4 comes out of cloth 3 assuredly because cloth press 5 prevents cloth 3 from rising up. In this way, loop pile can be created suspended from looper 11 under cloth 3. The protrusion dimension of the aforementioned loop pile below cloth 3 is a pre-set designated dimension because cloth catch component 38 keeps cloth 3 from sagging.

(0013)

Next, as shown in Figures 7 (C) and (F), yarn holding means 16 pinches yarn section 52b at a location closer to needle 4 than the planned cutting location 52a (area contacting aforementioned blade 31) and holds it (main shaft angle of  $360^\circ$ ). Next, as shown in Figure 7 (D), picked up yarn 52 is cut in planned cutting location 52a by moveable knife 32 operation. After that, as shown in Figure 7 (E), looper 11 returns to its original withdrawal location (main shaft angle of  $360^\circ$ ) while the end of yarn 52b joined with needle 4 remains held in place by yarn holding means 16. At this time, since yarn 52b joined with needle is held in place by yarn holding means 16, the yarn will not accidentally come out of cloth 3 even if the rising of needle 4 toward top dead center pulls on that yarn 52b. After that, cloth 3 moves laterally by the amount of one needle based on movement of cloth holding frame 2, and also yarn holding by yarn holding means 16 is released. Since the aforementioned yarn 52 has been cut, thereby eliminating the relationship between looper 11 and cloth 3 in terms of the yarn, lateral movement of cloth 3 can be made in any desired direction fore, aft, left, or right. Also, for that lateral movement, cloth catch component 38 is in the down position, and furthermore, the upper end of several cloth catch pieces 39 which comprise the cloth catch component 38 are slender bar-shaped catch pieces and therefore the yarn which has been cut and is hanging downward below cloth 3 can slip through laterally without interference with cloth catch component 38. When the above motion is repeated while moving cloth 3 in various directions, an embroidered pattern will be formed on cloth 3. In addition, it would also be

acceptable for the aforementioned cloth catch component 38 to be fixed in the aforementioned up position.

(0014)

(Effects of the Invention)

As seen above this invention has the characteristic of: when sewing, after yarn 52 is carried to the lower side of cloth 3 by needle 4 and is picked up by looper 11, yarn 52b connected to and closer to needle 4 can be held by yarn holding means 16 before yarn is cut by yarn cutting means 30, and therefore even if yarn 52 is cut at the time that even just one loop has been made by yarn suspended from looper 11, yarn 52b connected to needle 4 can be prevented from coming out of cloth 3 accompanying later needle 4 movement. That is [the characteristic], of being able to break the connection between cloth 3 and looper 11 by cutting yarn 52 even if just one loop has been made, and as a result, cloth 3 can be moved in any desired direction fore, aft, left, or right, and thus it [the invention] has the advantage of being able to form a free embroidered pattern.

(0015)

In addition, in the invention, cloth catch component 38 is vertically moveable and at the same time the upper ends of each of the cloth catch areas 39a are slender bar-shaped and positioned on several cloth catch pieces 39 arranged with gaps between them. Due to this structure, when sewing and cloth 3 is laterally moved after yarn 52 is cut, the cut yarn can slip through without any interference occurring between cut yarn and cloth catch component 38, regardless of whether direction of cloth movement is fore, aft, left, or right, and thus it [the invention] has the effect of being able to excellently maintain finished product texture by maintaining the condition of cut yarn standing from cloth 3.

(Brief Explanation of Drawings)

(Figure 1) Longitudinal cross section of main components.

(Figure 2)

Drawing of Figure 1 viewed from the right side.

(Figure 3)

Inclined view showing relationship between looper, yarn holding means and yarn cutting means.

(Figure 4)

Plan drawing that shows the relationship between cover component opening and mechanisms exposed there.

(Figure 5)

Inclined view that shows cloth catch component, its support mechanism and up/down mechanism.

(Figure 6)

Time chart for explanation of operations.

(Figure 7)

(A) through (E) are partial drawings that show machine component conditions at noted main shaft angles. (F) is a drawing of (C) viewed from the right side.

(Legend)

- 3 Cloth
- 4 Needle
- 11 Looper
- 16 Yarn holding means
- 30 Yarn cutting means

Figure 1

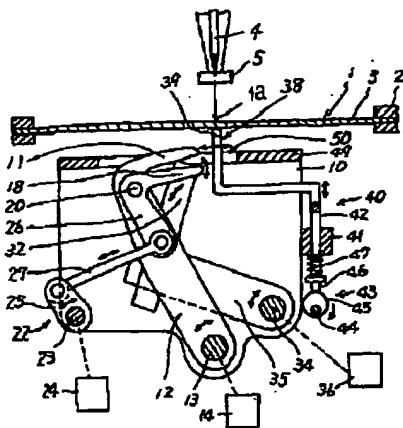


Figure 2

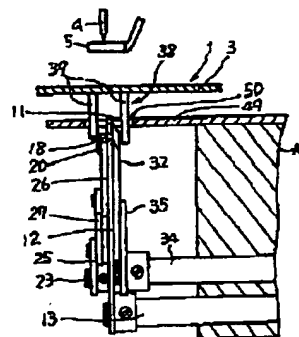


Figure 3

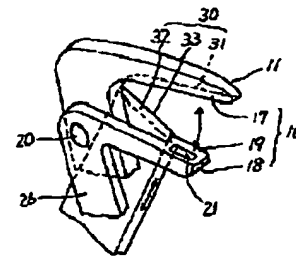


Figure 4

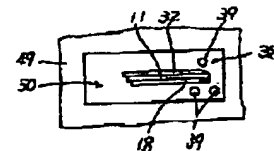




Figure 5

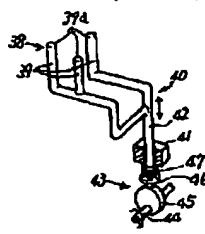
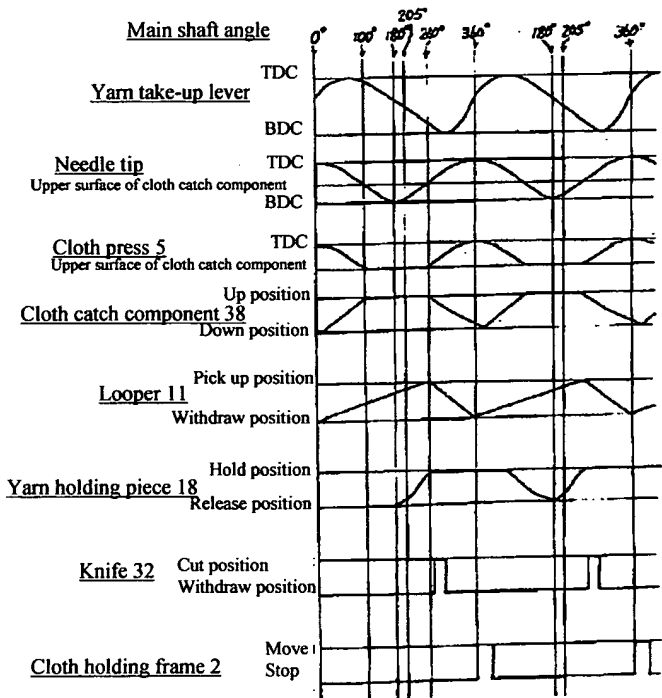
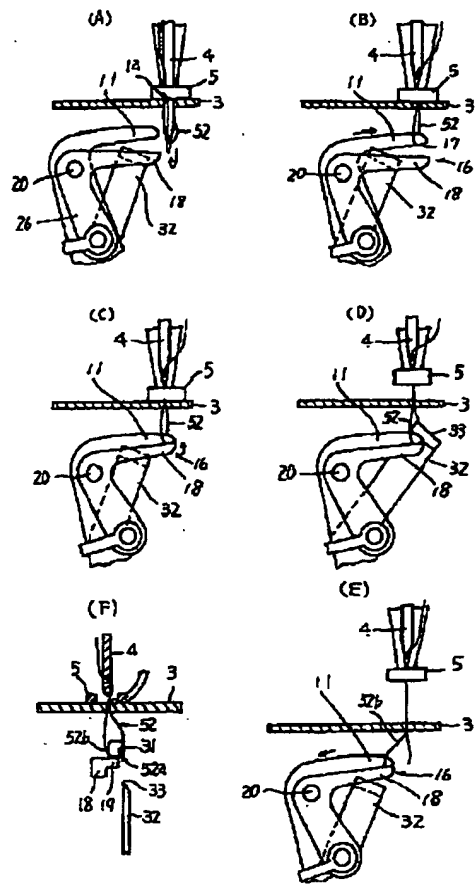


Figure 6



Note:  
TDC = Top Dead Center  
BDC = Bottom Dead Center

Figure 7



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